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so. But meanwhile there is no good reason for condemning the use of insecticides and fungicides because they have not proved to be the universal panacea for all the farmers' ills.

I believe it may be asserted without fear of successful contradiction that fungicides, and especially Bordeaux mixture, properly made and properly used, will repay many times over the cost of manufacture and application. When in addition to this we have good farming there is every reason for confidently expecting results which without their aid it would have been impossible to secure.

JOSEPH F. JAMES.

Washington, D. C., Dec. 22, 1893.

Expressions of Emotion in Birds' Song.

FROM the note of Mr. B. S. Bowdish I see that *Science* has taken up the question of expression of emotions in the "song" of birds. First of all, I hope to be allowed to refer to Severin Petersen's excellent book, "Vore Langfugle" (Our Singing Birds), published by Gad in Copenhagen, Denmark.

Then, I wish to immortalize the name of Hans, a canary bird, and a comfort to our home for about eight years. I have watched this bird, and know more about him than anybody else.

1. When I entered my rooms, and called him by name, he would say his "pip" with a sweet, whistling sound; he plainly was glad, and whenever I repeated his name his kind "pip" would sound through even three walls. 2. When he happened to see his enemies, the sparrows, or another male bird, Hans used to start a loud, shrill "song," laying his wings close to his body, while the feathers on his throat were standing almost straight out from the skin. This shrill song was different from 3, the song that came from him (*a*) when he was singing to the female or (*b*) when he sang just because he was glad. 4. If anybody scared our bird, a "pip" was heard from him, but different from that mentioned under 1. It was now uttered subdued, *sotto voce*, and with the bill closed; it sounded like "mi-i." This was especially the case when the bird saw a hat; there was nothing in the world of which the bird was more afraid than a hat or an umbrella. Though I am tempted, I shall venture no generalizations. When he became excited, he would sing even while eating, and so he would when he saw me. A *Dracaena* now shades his grave. Here is a question which should be taken up, like that of expression of emotion in man. Abundance of facts is noted (see the various volumes of Humboldt) and may be collected from many sources. It is a fascinating biological question which ought to be worked up *experimentally* also. I agree with Mr. Bowdish that there are many observers of birds who could not fail to see expressions of emotion in birds' song, when their heart is in their study. Stating the facts above, I hope that somebody will take up the question. I should be much mistaken if all conscious beings gifted with a voice could not express their emotions that way.

J. CHRISTIAN BAY.

Ames, Iowa, Dec. 11, 1893.

BOOK-REVIEWS.

The Ore Deposits of the United States. By JAMES F. KEMP, A.B., E.M., Professor of Geology in the School of Mines, Columbia College. New York, The Scientific Publishing Company. 1893, 256 p., ill., \$4.

PROBABLY no branch of geology is possessed of so scant a literature as is that treating of its economical relations, and yet certainly no branch of this science is more

deserving of notice from its highly practical bearing upon the development of a country's resources. Prof. J. D. Whitney's "Metallic Wealth of the United States" (1854) was eagerly welcomed, but while this work has become classic it has become, also, of mere historical value. New mines have been opened in regions then unknown, new resources have been discovered and new methods of metal winning introduced, while, on the other hand, deposits then of greatest value have been worked out and deserted, and this not alone in the case of individual mines but over vast fields embracing wide areas of country. It is then in the scattered literature and in the works of foreign authors that American students of to-day have been compelled to seek a knowledge of American ore deposits. Moreover, the class most in need of this information, and for whom it would have the greatest value, is precisely that class to whom, from location and other causes, this scattered and foreign literature is least available. Nor are the foreign authors exact in their descriptions of American localities; authoritative writing can only come with extended study and the personal acquaintance gained by residence. For purposes of study and reference a correlation of our literature is necessary, and this can, necessarily, be accomplished only by one thoroughly acquainted with the ore deposits themselves.

The present work by Prof. J. F. Kemp has been received with greatest applause by all interested in mining and in economic geology. Concise in itself, it supplies an exhaustive reference to original papers, and places at once in the hands of the student or engineer a key to more extended research. As stated by the author in his preface, the purpose of the book is two-fold; first, it is intended to supply a condensed account of the metalliferous resources of the country which will be readable and serviceable as a text book and work of reference; and, second, it is hoped that the work will stimulate a study of the phenomena described. In carrying out this purpose the best work of recent investigators on the origin and changes of rocks, by microscopic study, and by the artificial production of ore and gangue material, has been constantly kept in mind. An acquaintance with geology and mineralogy is presupposed, only the more general geological facts and principles being given in Chapter I., together with the geological scale and the geographical distribution of the principal geological groups. Chapter II. discusses the formation of cavities in rocks, embracing those produced by local contraction and those formed by the more extensive movements in the earth's crust. Chapters III. and IV. treat of the minerals important as ores and on the filling of mineral veins. Lateral secretion, ascension by infiltration, replacement and other theories are here ably discussed, the author rejecting the contemporaneous formation, decension and sublimation of von Cotta's summary in the *Erzlagertatten*. The theory of electrical activity, once so popular, is given in brief at the end of Chapter V. This chapter describes in some detail the structural features of mineral veins, the changes in character of vein filling and the secondary alteration of the minerals in veins. Chapter VI., the last of Part I., discusses exhaustively the classification of ore deposits. While a systematic arrangement, such as is possible in mineralogy, would fail in the grouping of ore deposits owing to the diversity of material and lack of definite demarkations, still this subject is of vast importance, and a classification is absolutely necessary to intelligent discussion and description. The author has given in summary the various classifications which have been proposed, grouping them under the following several heads: *a.* schemes involving the classification of veins only; *b.* schemes based upon form; *c.* schemes based partly upon form, partly upon origin;